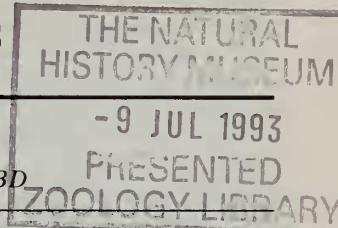


A new snake from St Lucia, West Indies

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SYNOPSIS. The *Clelia clelia* reported from Dominica and St Lucia are reinvestigated. The specimens concerned are recognised as a new species, *Clelia errabunda*. It is derived in relation to the mainland species *C. bicolor* and *C. rustica* and is the primitive sister species of the mainland *C. clelia*, *C. equatoriana* and *C. scytalina*. As such it is interpreted as an island relict. Records from Dominica and Guyana are rejected, the St Lucia records are confirmed.

INTRODUCTION

Nearly a hundred years ago Boulenger (1896) reported the South American snake *Oxyrhopus clelia*, now known as *Clelia clelia*, from the Windward Islands of Dominica and St Lucia, as well as from mainland localities. Ever since then this species has been listed for these two islands, either in the genus *Clelia* (Barbour, 1930; Schwartz & Henderson, 1988) or *Pseudoboa* (Barbour, 1935, 1937). There are other records of this snake for St Lucia but this remains the only record for Dominica.

Boulenger (1896) distinguished two varieties of '*Oxyrhopus clelia*': A, with 19 scale-rows at mid-body, and B, with 17 scale-rows. Under variety 'B' Boulenger lists: two specimens from 'The city of Mexico', three specimens from 'W. Ecuador' and one specimen each from 'Demerara', 'Dominica' and 'St Lucia'.

Bailey (1970, in Peters & Orejas-Miranda) gives a key to the mainland species of *Clelia*. The city of Mexico specimens key out as *Clelia scytalina*, the Ecuador specimens as *C. equatoriana*. The remaining three specimens reach the *scytalina-equatoriana* couplet of the key but are not clearly assignable to either mainland species. Boulenger's variety 'A' specimens key out as *C.c.clelia* and *C.c.plumbea*, the two subspecies recognised by Bailey. *Clelia* was later reported from the island of Grenada. It was described by Greer (1965) as *Clelia clelia groomei*; Bailey places this in the synonymy of *C.c.clelia*.

Further examination of these remaining three specimens shows that they represent an unrecognised species. In the hope of determining the affinities of the new form the specimens of *Clelia* in the collection of The Natural History Museum, London were examined. A Paris Museum specimen from St Lucia was also examined. The seven species recognised by Bailey are represented. It should be noted that Scrocchi and Viñas (1990) have now sunk *occipitolutea* in the synonymy of *clelia*.

MATERIALS AND METHODS

Each specimen was examined in respect of external features, anterior viscera, maxillary teeth and, in the case of males, hemipenis. For a representative of each species dissections were made to show the superficial jaw muscles, ligaments and

labial glands and the upper and lower jaws.

The ventral scale count is according to Dowling (1951). The notation for the scale-rows on the trunk allows a detailed record in a single line of type using characters on a word processor keyboard. An oblique transverse scale-row is identified by the ventral scale from which it passes backwards, as shown by M.A. Smith (1943, fig. 10). Where there is a scale-row fusion the upper of the two merged rows is indicated. For example male specimen BMNH 89.4.8.2 is recorded as:

V 210 >>5> 17 (36;5</33;5<) 19 (145;4>/142;4>) 17

Ventral scale count 210. Three scale-row fusions from the back of the head onto the neck, the third recognisable as due to the fusion of row 5 with the row below. Seventeen rows on the neck through oblique row 36 left/33 right; row 5 splits giving rise to 19 rows through oblique row 145 left/142 right; row 4 merges with row below giving 17 rows. Most specimens were recorded down the left-hand side only (Table 1, see Appendix).

The subcaudal count starts with the first scale on the left side which makes full contact with a scale obliquely forward and opposite. The dorsal scale-rows on the tail are somewhat irregular around the base but settle down to even row stretches: 8, 6, 4, 2. The fusions are rarely symmetrical so that there are short odd number transitions between the even stretches. Each transition is included in the preceding, higher, even row stretch. The transverse rows are identified by the subcaudal scale-row pairs from which they arise obliquely. The tail of the above specimen was recorded as:

79 prs, >8 (10) 8 (25) 6 (45) 4 (73) 2

More than eight longitudinal rows through oblique row ten, eight (and seven) through row 25, six (and five) through row 45, four (and three) through 73 and two rows to the terminal scute. From this record the lengths of the five stretches are calculated as the basis of comparison of the individual specimens. The above becomes:

C 79 >8:10 8:15 6:20 4:28 2:6

This feature shows marked sexual dimorphism.

For selected specimens scales were mounted on slides to be examined for the presence of pits and tubercles (Underwood, 1963). The wet scales are laid on a dried film of polyvinyl alcohol lactophenol mounting medium. When dry the slide is then covered using Canada balsam. For each specimen the

scales mounted are the frontal, a parietal and a vertical series of scales at about mid-trunk from row one to the vertebral.

The immunological studies of Cadle (1984) suggest that species of *Pseudoboa* are sister to *Clelia*; his sample included the type species of each genus. He also found that *Oxyrhopus fitzingeri* is closer to *Clelia* plus *Pseudoboa* than it is to other species of *Oxyrhopus*. '*Oxyrhopus*' *fitzingeri* is therefore included as part of the outgroup. In the absence of an analysis, the majority outgroup condition is taken to be primitive for the ingroup.

The four species of *Pseudoboa* recognised by Bailey share the special feature of single subcaudals. No evident special feature unites the species of *Clelia*. On further study the boundary between the two genera may be redrawn, or abolished so that the assignment of the species discussed here may be changed.

The loreal is rather variable. It may be about as large as the preocular, in which case it meets supralabials two and three. It may be smaller and may meet only supralabial two. It may be absent allowing the prefrontals to meet the supralabials, or the nasal to meet the preocular (as a unilateral variant, *C. clelia* BMNH 89.4.8.2). A large loreal is assumed to be primitive.

Boulenger (1896) distinguishes between those *Oxyrhopus* (s.l.) in which the preocular reaches the upper surface of the head and those in which it does not. The distinction appears to be real but it can be influenced by the condition of the specimen and by the angle of view. The supraocular scale meets the preocular and often, also, the prefrontal scale. The lengths of the supraocular-preocular and the supraocular-prefrontal sutures are compared. The prefrontal suture may range from two or three times the length of the preocular suture, as in *Clelia rustica*, to absent, as in *Oxyrhopus petola* in which the preocular meets the frontal.

There are one preocular and two postoculars. The temporals are 2:3. The upper anterior temporal always meets postoculars; the lower may meet them (represented by $+/-2:3$) or may not meet them ($+/-2:3$). In every species represented by more than two specimens this contact is variable. Where the temporal does not make contact the labial scale is higher than its neighbours. However, *rustica* is nearly constant, on only one side of one of nine specimens does the lower temporal make contact (BMNH 95.9.17.21). The outgroup is also variable so polarity is uncertain. In one *rustica* there is no suture between prefrontal and preocular (BMNH 86.1.19.21).

There may be three or two anterior supralabials. As three is the commonest number in the outgroup it is assumed to be primitive. There are two supralabials meeting the eye and three postocular supralabials. Anterior and posterior infralabials are distinguished. The last anterior infralabial is pentagonal; from it starts the posterior row and a mesial row. The anterior infralabials are usually five. Four and six occur as unilateral variants; one *rustica* (BMNH 1909.11.2.16) has four symmetrically. The posterior infralabials range from four to two. As four is the commonest number in the outgroup this is assumed to be primitive.

The genials range from posterior about as large as the anterior to somewhat smaller. This does not appear to be a taxonomically useful feature.

There are always two, sometimes three, scale row fusions from the back of the head onto the neck. The rows on the neck may be 19 or 17. As a majority of the outgroup have 19 this is inferred primitive. In those with 19 rows this number

continues through mid-body and then reduces by fusion of row four or five with the row below to 17 rows. The vertebral or paravertebral rows were not seen to be involved in scale-row changes. Those with 17 neck rows may continue without change to the end of the trunk. In some specimens, however, a lateral row splits on the posterior neck to give rise to 19 rows through mid-body, then reducing to 17 rows. Such a minimum on the neck rising to a maximum around mid-body and falling towards the vent is widespread in henophidian grade snakes (Underwood and Stimson, 1990). However, this condition is found in none of the outgroup so it is here assumed to be a derived, pseudoprimitive feature. The scale-row pattern is scored as 19:19:17 (inferred primitive), 17:19:17 or 17:17:17.

In some specimens the vertebral scale-row is undifferentiated, but in many it is wider than the paravertebral rows. This modification is a little more pronounced towards the posterior trunk. As most of the outgroup have undifferentiated vertebral scales this is assumed to be primitive.

These snakes usually have both scale pits and tubercles (Underwood, 1963). The pits are confined to the apices of the scales of the trunk and tail, where they usually occur in pairs. Tubercles may be numerous on the head scales. On the trunk they are rather irregularly distributed around the centre of each scale; numbers range from five to zero (Fig. 2). Both pits and tubercles tend to be better developed on the upper scale-rows. Where the vertebral scale-row is enlarged they may be reduced or missing. Pits and tubercles are found in the outgroup and their presence is inferred primitive.

The anterior viscera were examined and their positions recorded in ventral scale units. This has the advantage that juveniles and adults can be compared. Organ positions determined by measurement are subject to allometric change (Thorpe, 1975). The features recorded are: tip of the hyoid, tip of the ventricle, anterior end of the liver and the end of the tracheal cartilages. In all the entry of the trachea into the right lung is terminal. This is a derived condition which Wallach (personal communication) reports to be general in Xenodontine snakes. In all there is some extension of the vascularisation of the lung into the roof of the trachea, but it does not extend far forwards of the heart. The left lung may be present but small, up to about one or two scale-units long and vascular; it may be a non-vascular vestige or it may be absent. Presence is inferred primitive.

The trachea may terminate no more than three or four scale-units beyond the tip of the heart. It may extend to overlap the liver, in some cases extending the full length of the vascular portion of the lung to reach the terminal air-sac. A short trachea is inferred primitive.

Counts are made of the teeth, and empty tooth places, of the left maxilla. The solid teeth show a moderate increase in size from front to rear. They are followed by an interval and two obliquely placed teeth with anterior grooves (Fig. 3). Polarity is not inferred. In one juvenile specimen (*clelia*, BMNH 1933.6.24.102) no grooves could be seen, even when the maxilla was removed and dried. The anterior tooth count is recorded. For sample specimens counts were made of the teeth on the dentary, palatine and pterygoid bones. They all have a full length choanal process of the palatine bone with a broad base, about half the length of the palatine, which sweeps backwards into a process which overlaps the pterygoid bone by two to three teeth (Fig. 3). The maxillary process of the palatine is turned backwards; it bears a

foramen for the maxillary nerve which emerges on the underside anteriorly.

For sample specimens the skin on the side of the neck was turned forwards to expose the superficial jaw muscles and ligaments and the labial glands. The most superficial muscle, which is easily damaged, is the constrictor colli (Haas, 1973). In the outgroup this is a thin sheet of muscle which passes from about the level of the head of the quadrate backwards and downwards over the jaw articulation to insert on the skin of the throat. In the species of *Clelia* examined the muscle follows a similar course, the anterior portion has a diffuse origin on the surface of the adductor externus profundus muscle. The posterior portion arises on the head of the quadrate; this is inferred derived (Fig. 4).

The cervico-mandibularis muscle arises from the back of the neck and passes downwards and forwards to insert on the articular head of the quadrate (Fig. 4). This appears to be a primitive condition. From the articular head of the quadrate arises a ligament which passes forwards and divides. The lateral, labial portion inserts on the posterior supralabial scales and onto the capsule of Duvernoy's gland. It peels off the supralabial scales rather more easily than is usual in snakes; this is thought to be derived. The mesial, maxillary ligament passes forwards to insert on the posterior lateral corner of the maxilla.

undifferentiated vertebral scale row, no left lung and a short trachea extending no more than five ventral scale units beyond the tip of the ventricle. Distinguished from *rustica* and *bicolor* by absence of a left lung. Distinguished from *clelia*, *equatoriana* and *scytalina* by the undifferentiated vertebral scale-row and short trachea. Further distinguished from *clelia* by 17 scale-rows from neck to vent.

Holotype: BMNH 89.8.14.25, male, St Lucia, West Indies, collected by G.A. Ramage, presented by West Indies Exploration Committee; snout-vent c.112 cms, tail 32 cms with extreme tip missing.

Paratype: MNHP 7598, male, St Lucia; snout-vent c.116 cms, tail 29+ cms with tip missing.

Referred specimens: BMNH 89.8.14.12, female, 'Dominica', West Indies, collected by G.A. Ramage, presented by West Indies Exploration Committee, snout-vent 138 cms, tail 27.6 cms.

BMNH 1988.717, female, 'Demerara', presented by Capt E. Sabine, R.E., snout-vent 117 cms, much of the tail is missing.

The other species of *Clelia* are widely distributed on the South and Central American mainland and a few offshore islands (Bailey, 1970). The name is taken from the Latin *errabundus* = wandering, in reference to the occurrence of the new form well outside the range of its mainland relatives.

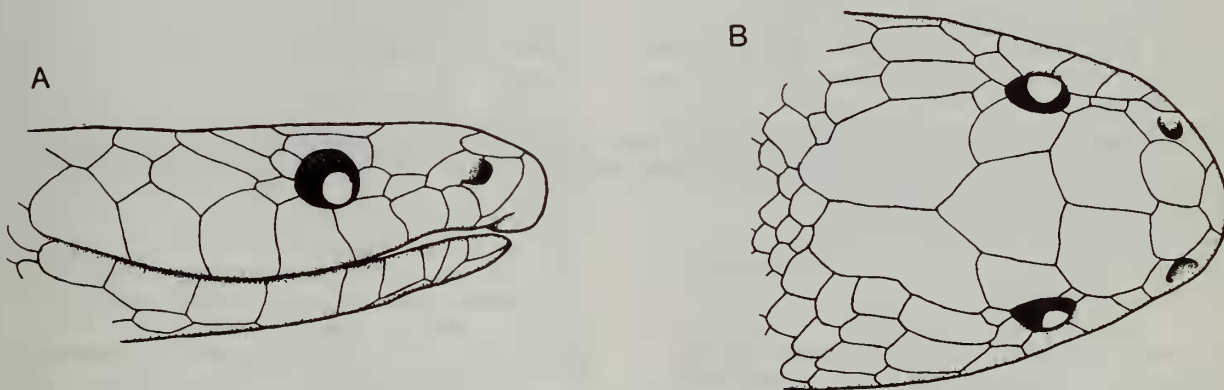


Fig. 1. *Clelia errabunda* sp. nov., type BMNH 89.8.14.25. A, lateral view of head (reversed on account of distortion of right side of head); B, dorsal view of head.

Mucous supralabial glands extend along the margin of the upper lip from the corner of the mouth to the snout. There are similar glands along the margin of the lower jaw. Mesial to the three posterior supralabial scales lies the Duvernoy's (venom) gland (Fig. 4).

At the level of the corner of the mouth, mesial to the maxillary ligament, is the organ termed anterior temporal gland by Smith & Bellairs (1947) and rictal gland by McDowell (1986). It is found in all of the species examined; it is usually visible mesial to the posterior end of the Duvernoy's gland (Fig. 4).

RESULTS

Clelia errabunda sp. nov.

DIAGNOSIS. A species of *Clelia* with uniform dark grey adult colouration of the upperside of the head, trunk and tail, extending to the lateral margins of the ventral scales, an

The type has two preocular scales on one side, seen in no other specimen of *Clelia*. All have two anterior and three posterior temporals. The lower anterior temporal scale meets a postocular in the type only. The 'Demerara' specimen has three anterior supralabial scales on the left-hand side, seen elsewhere only in *C. bicolor*. All have five anterior infralabial scales and three posterior. The anterior genials are little, if at all, larger than the posterior. The four specimens have tubercles but no pits on the head, as in other *Clelia* and *Pseudoboa*. The number of frontal and parietal tubercles is high. Most of the trunk scales bear paired apical pits, as is usual in *Clelia*, and a moderate number of tubercles (Table 2, see Appendix).

The island specimens have 14 anterior maxillary teeth (on the left), which is higher than for *clelia* and *equatoriana* (Table 3, see Appendix); the 'Demerara' specimen has 13/12. The ventral scale counts are high for *Clelia*, but not extreme. The subcaudal scales are entirely paired, save that the last one is single in the 'Dominica' specimen. Apart from the difference of sex the three island specimens are very similar.

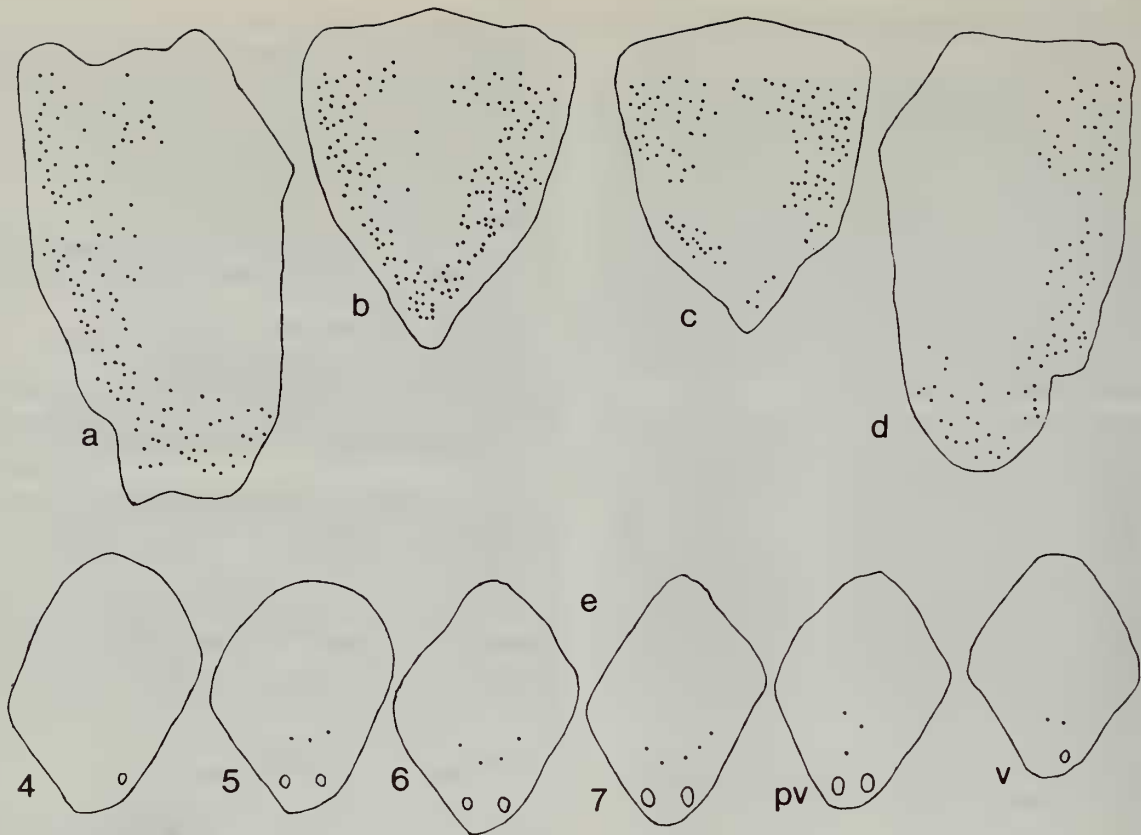


Fig. 2. *Clelia errabunda* sp. nov., mounted scales to show distribution of tubercles and pits. a,b, parietal and frontal of BMNH 89.8.14.12; c,d, frontal and parietal of BMNH 89.8.14.25 (type); e, mid-trunk scales of BMNH 89.8.14.12, from rows: 4, 5, 6, 7, paravertebral and vertebral. The lower rows lack scale-organs.

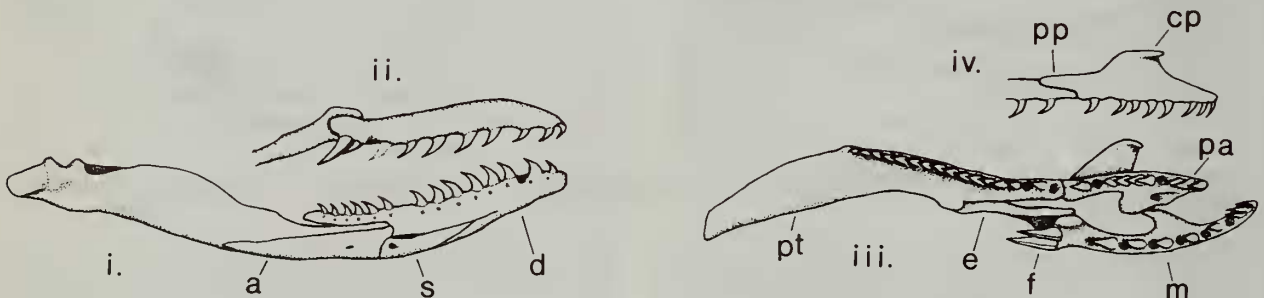


Fig. 3. *Clelia errabunda*, BMNH 85.8.14.12. i, mesial view of lower jaw: a = angular, d = dentary, s = splenial; ii, lateral view of left maxilla (reversed); iii, ventral view of left upper jawbones: e = ectopterygoid, f = fangs with grooves, m = maxilla, pa = palatine, pt = pterygoid; iv, mesial view of left palatine-pterygoid articulation: cp = choanal process, pp = posterior process of palatine.

The 'Dominica' female has 234 ventrals and 71 subcaudals: total 305. The type male has the extreme tip of the tail missing, judged to be not more than two pairs of subcaudals. It has 221 ventrals and 82 + (?)2 subcaudals: total 303 + (?)2. The paratype male has 224 ventrals and 75+ subcaudals. The 'Demerara' female has 230.5 ventrals and only 36 remaining pairs of subcaudals.

The 'Dominica' specimen has a Duvernoy's (venom) gland from behind the eye to the corner of the mouth; it is as high as the supralabial scales plus the lower temporal scales. The hemipenes of the two males are 18 subcaudal scale units long, there are prominent lobes on a shaft 13 units long. The sulcus spermaticus forks on the shaft at scale six (type) or seven (paratype). Proximally on the shaft there are very fine spines

and, in the retracted organ, longitudinal folds. From scale nine to the cleft there are large spines, about 26 in the type and 38 in the paratype; these are high counts for *Clelia*. At the base of each lobe there is a large spine, as is usual in *Clelia*. the branch sulcus passes down the middle of an area of large calyces with a clear margin (a capitulum).

Inspection of The Natural History Museum register raises a doubt about the provenance of the Dominica specimen. G. A. Ramage brought back a collection of herpetological specimens from Dominica and St Lucia. These were registered in 1889. They are entered in Boulenger's hand. The register starts (with present identifications substituted):

89.8.14. 1-8 *Typhlops dominicana* Dominica, June '89

9-11	<i>Alsophis antillensis</i> <i>sibonius</i>	Dominica, June '89
12	<i>Clelia errabunda</i>	Dominica, June '89
13	<i>Bothrops caribbaeus</i>	Dominica, June '89
14	<i>Thecadactylus</i> <i>rapicauda</i>	St Lucia, April '89

There follow another eight species attributed to St Lucia, including the St Lucia endemics *Hyla rubra*, *Sphaerodactylus microlepis*, *Anolis luciae* and *Liophis ornatus*. These St Lucia attributions are not therefore in question. Boulenger's St Lucia entries are interrupted by four fish entries in a different hand.

The *Typhlops* and *Alsophis* are forms endemic to Dominica. What, however, attracts attention is the record of *Bothrops* from Dominica. We may be sure that if a pit-viper were living on this island there would have been further reports since 1889. It is clear that the *Bothrops* was mistakenly attributed to Dominica. The specimen of *Clelia* appears to be the only documented record of the genus from Dominica. Is this attribution to Dominica also a mistake? On the other hand there are several further specimens of *Clelia* from St Lucia in the Museum of Comparative Zoology.

In addition to *Alsophis antillensis*, there is no more than hearsay evidence of a second species of black snake on Dominica. Bullock & Evans (1988) list *Clelia clelia* on Dominica as 'Tete-chyen nwe'. Dr Bullock writes that he has not seen *Clelia* but he has reports from informants whom he regards as reliable. Dr R. Thorpe, Miss A. Malhotra and Mr M. Day have come across no evidence of *Clelia* on the island. On Dominica it would be distinguished from *Alsophis* by the uniform black dorsal colouration and by 17 dorsal scale rows on the anterior trunk. The *Alsophis* has some irregular yellow markings and 19 scale rows anteriorly. Unless and until there is clear evidence of the occurrence of *Clelia* on Dominica it should be dropped from the island list. Barbour (1930) says of '*Clelia clelia*' that "This species is surely extinct on St Lucia. . .". Long (1974) writes that "the cribo no longer exists in St Lucia. . .". Dr D. Corke also reports that he has found no trace of the survival of *Clelia* on St Lucia.

Even greater doubts arise about the provenance of the 'Demerara' specimen of *errabunda*. The specimen had no original registration number; the Museum register starts in 1837. A search of the early entries shows no record of specimens from E. Sabine. The Museum archivist reports that the trustees' minutes record donations from Capt Sabine between 1818 and 1824 with, however, no indication of any from the Caribbean.

The collection has other snakes from 'Edw. Sabine'. There is a male *Xenodon merremi*, a species widely distributed in South America and known from Guyana on the basis of other specimens. There are a male and a female of *Oxyrhopus trigeminus*, not otherwise known from this part of South America.

There are also two lots of *Bothrops*. A female from 'Capt Sabine, Berbice' and two females and a male from 'Col Sabine, Demerara'. These were compared with specimens of *B. atrox* and *B. brazili* from Guyana and with *B. caribbaeus* from St Lucia. With ventral and mid-body counts of: M 201:26, F 205:27, F 206:29 and F 210:29 they fall within the range of counts reported by Lazell (1964) for *caribbaeus*. The postocular stripe passes across the last supralabial scale dorsal to the corner of the mouth as in *caribbaeus*. The ventral scales are laterally peppered with dark spots, as in *caribbaeus* and

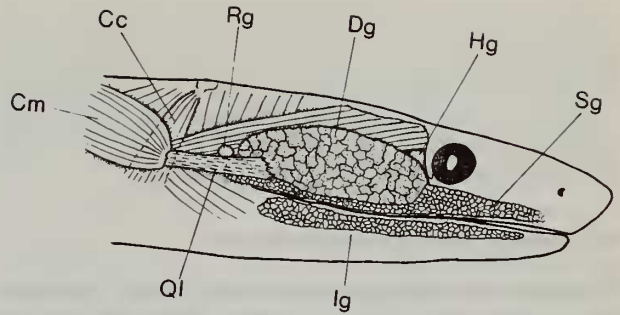


Fig. 4. *Clelia errabunda* sp. nov., BMNH 89.8.14.12. Dissection to show superficial head muscles and glands (reversed).

Cc = constrictor colli muscle, overlaying other structures;
Cm = cervico-mandibular muscle; Dg = Duvernoy's gland;
Hg = Harder's gland; Ig = infralabial gland;
Ql = quadrato-labial ligament; Sg = supralabial gland;
Rg = riactal gland.

brazili and unlike *atrox*. In all, the dorsal bands are indistinct. In two of the Demerara specimens the bands can be seen to have parallel sides or to converge towards the dorsal midline as described by Lazell for *caribbaeus*. The third shows some diverging bands. The Guyana *atrox* have dark patches on the lower flanks which extend onto the ventrals unlike these Sabine specimens. The *brazili* have dark bordered bands which converge towards the midline. These observations suggest that the 'Berbice' and 'Demerara' specimens are most probably *caribbaeus*, a species known only from St Lucia. The above considerations raise a doubt that Sabine collected any specimens in Guyana.

It is evident that Sabine was long enough, supposedly in Guyana, to achieve promotion from captain to colonel; in that time he may well have visited St Lucia. The locality of the 'Demerara' *Clelia errabunda* is therefore discounted. The uniform 17 scale-rows and undifferentiated vertebrae would distinguish it from local *Clelia clelia*.

Dumeril, Bibron & Dumeril (1854) report that the Paris museum has specimens of '*Brachyruton cloelia*' from Guyana, Brazil, Mexico and Guadeloupe. The 'Guadeloupe' specimen (MNHP 169) is a hatchling with counts V200, C83 and 19:19:19 scale rows. The tip of the heart is at V46, the trachea extends beyond V90. This is clearly a specimen of *Clelia clelia*, with an unusually low ventral count. The locality is undoubtedly erroneous.

In the Proceedings of the Philadelphia Academy for 1870 it is reported that Cope "called attention to a large specimen of *Trigonocephalus* (= *Bothrops*) from St Lucia, of which some fourteen inches was enclosed in the oesophagus and stomach of a larger *Oxyrhopus plumbeus* (= *Clelia clelia*)." Later Cope (1876) wrote that, as he had previously observed, he had received a specimen of *Clelia clelia* from Martinique(!) which had swallowed a large *Bothrops*. Malnate (personal communication) examined the specimen(s). It is ANSP 10220 from 'Santa Cruz', received from Mrs J.L. Endicott. 'Santa Cruz' presumably means St Croix in the Virgin Islands! It is unlikely to be a St Lucia locality; most of the place names are French. This one specimen thus has three different geographical attributions!

Malnate reports that the *Clelia* has 17 scale-rows throughout and an undifferentiated vertebral scale row; it therefore fits *C. errabunda*. The half-swallowed *Bothrops* has 25 scale rows about midbody, falling to 19 rows. Lazell (1964) gives

mid-body scale-row counts for *Bothrops caribbaeus* from St Lucia as 25–29 (mode 27) and for *Bothrops lanceolatus* from Martinique counts from 29–33 (mode 31). The Philadelphia Academy specimen, with 25 rows, is at the lower end of the range for St Lucia specimens. Beyond reasonable doubt therefore Cope had a specimen of *C. errabunda* which had half swallowed a St Lucia *Bothrops caribbaeus*.

Relationships of *Clelia errabunda*

The species currently assigned to *Clelia* can be arranged at several levels on the basis of the derived states of the respiratory system, the vertebral scale row and the ventral scale counts. This is set out in Table 3.

C. bicolor. The three anterior supralabials, the low ventral scale counts, the undifferentiated vertebral scales, the presence of a left lung and a short trachea are primitive features. The high maxillary tooth count appears to be a derived feature.

C. rustica. This species also has undifferentiated vertebral scales, a left lung (a mere vestige in BMNH 81.7.2.9) and a short trachea. *C. rustica* and the following species are derived in relation to *bicolor* in respect of two anterior supralabials and higher ventral counts.

C. errabunda, *clelia*, *equatoriana* and *scytalina* share the derived feature of absent left lung. The latter three species are further derived than *errabunda* in respect of the enlarged vertebral scales and extended trachea.

The type specimen of *Clelia clelia* Daudin (1803) is not known to survive; however, the type locality is given as 'Suriname'. It is therefore assumed that specimens from the northern coast of South America are typical *clelia*. Specimens in The Natural History Museum from this area, from Central America, from Rio Condoto on the Pacific slope of Colombia

(1), from La Paloma nr Santiago R., Ecuador (1) and from most of the rest of South America show the 19:19:17 scale row pattern. However, a second specimen from Rio Condoto and specimens from Ecuador (Guayaquil and east of Loja, 2), Peru (3) and Manacapuro on the Amazon (1) show the 17:19:17 scale-row pattern. These are indistinguishable from typical *clelia* in respect of the other characters considered here. Their occurrence in a north-western area of South America with near overlap with the 19:19:17 (Rio Condoto) form on the Pacific slope of Colombia does not look like an accident of sampling (Fig. 5). The form in eastern Brazil (*plumbea*) lacks spines on the hemipenis, some specimens from the southern part of the range (*occipitolutea*) are pale in colour, so *clelia* is evidently a variable species. Roze (1959) reports a specimen from Venezuela with counts of: 21:22:19:17 and Chippaux (1986) reports a specimen with 21:19:17 rows from French Guyana.

After the above account was prepared I received from Zaher (personal communication) a photocopy of a portion of Bailey's unpublished PhD thesis. It is evident that at that time he regarded the island *Clelia* as sufficiently distinct to merit subspecific status. He too did not believe the Guyana localities of the Sabine specimens.

DISCUSSION

The species *clelia*, *equatoriana*, *scytalina* and *errabunda* share uniform dark adult colouration and absence of a small left lung. Most other pseudo-boine snakes have a small left lung and a more varied colour pattern. Within this group of four species *errabunda* is primitive to the others in that the vertebral scale row is not enlarged and the trachea is short.

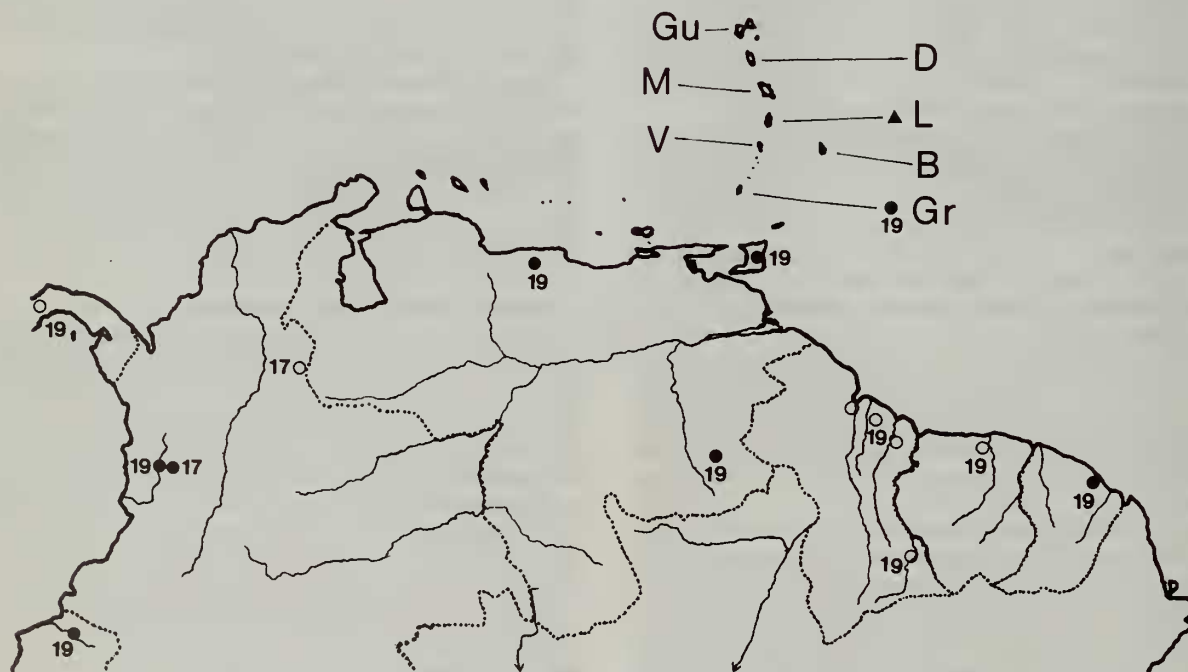


Fig. 5. Localities of specimens from northern South America and the Lesser Antilles. Solid symbols = precise localities; hollow symbols = approximate localities; circles = *Clelia clelia*; triangle = *Clelia errabunda*; 17, 19 = no of scale rows on neck of *C. clelia*. B = Barbados, D = Dominica, Gr = Grenada, Gu = Guadeloupe, L = St. Lucia, M = Martinique, V = St. Vincent.

Because the 19:19:17 scale row pattern is widespread in pseudoboine snakes and is also found in most *Clelia* we may infer that it was the condition of the ancestor of this species group. The 17:17:17 pattern shown by *errabunda* would thus be interpreted as a derived feature setting it apart. However, the occurrence of the 17:17:17 pattern in *equatoriana* and *scytalina* and the 17:19:17 and 21:19:17 patterns within *Clelia* suggests that little significance can be attached to the scale-row pattern. The most nearly special feature of the new species is the high number of large spines on the hemipenis. Otherwise it is close to the status of what Ackery and Vane-Wright (1984) call a 'paraspecies', without any special feature setting it apart. The short trachea and unmodified vertebral scales by which it is distinguished are primitive features found in hundreds of other species of snakes.

Greer (1965) reports that the Grenada *Clelia* is diurnal, unlike its mainland relatives. *Clelia clelia* from Grenada is otherwise little different from mainland *Clelia*; this is confirmed by Wallach's report (personal communication) that it has an extended trachea. It is presumably a relatively recent immigrant from South America. On the other hand *errabunda*, on St Lucia, is primitive to the mainland members of the *Clelia* group. This suggests that it colonised St Lucia at an early date and that its ancestral stock was later replaced on the mainland by the more derived *Clelia*. It is an example of a primitive form surviving as an island relict.

Boa constrictor occurs on St Lucia and Dominica. The two island populations and the mainland form are well differentiated from one another and are recognised as separate subspecies (Lazell, 1964). The pit-vipers, *Bothrops*, on the adjacent islands of St Lucia and Martinique are sufficiently differentiated that they are recognised as full species by Lazell (1964). For both *Boa* and *Bothrops* this suggests either separate colonisation of the islands from the mainland or colonisation of one island and passage to the other long ago. There is at present no evidence that these are primitive island relicts.

Cope (1870) is reported as saying that the "islands of Martinique and Guadeloupe had become so infested with the fer-de-lance" (*Bothrops lanceolatus*) "as to be in parts almost uninhabitable, and it was chiefly on account of the danger from this venomous reptile that collecting naturalists of late years had so seldom visited them"! "Some means had been adopted to check the increase of this pest, but with small results". "Prof Cope thought that as the *Oxyrhopus plumbeus* (= *Clelia clelia*) was very numerous in Venezuela and Brazil, and since it was very harmless and easily procured, that its introduction in large numbers into Martinique, etc, would be a simple matter, and one probably to be attended with good results in the diminution, at least, of this enemy of agriculture".

Lazell (1964) tells us that on both Martinique and St Lucia the local *Bothrops* is known as 'serpent'. We may speculate that prior to human arrival 'serpents' were already established on St Lucia before the 'cribo' (*Clelia*) arrived to prey upon them.

It is said that the mongoose was introduced into St Lucia in the hope that it would reduce the *Bothrops*. Today, although the mongoose may eat *Bothrops*, it also eats domestic poultry. Following human disturbance, it is ironic that the indigenous 'pest', the 'serpent', is supplemented by an introduced pest, the mongoose, and the indigenous biological control, the 'cribo', is extinct! In the absence of this 'control' Lazell (1964) reports that in some areas of St Lucia the serpent is 'abundant beyond belief'.

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APPENDIX

Table 1 Some representative specimens of *Clelia*, showing: sex, ventrals, scale row reduction pattern, scale row stretches on tail. * = type specimen of *Oxyrhopus maculatus* Boulenger.

	V	Row reductions	C	Tail row stretches					
				>8	8	6	4	2	
<i>scytalina</i>									
	68.4.7.7	M 212	>>19(12;5>)17	75	15	11	20	25	4
	68.4.7.8	F 209	>>>19(7;5>)17	83	11	14	22	30	6
<i>equatoriana</i>									
	60.6.16.47	M 201	>>17	75	5	17	23	30	0
	Geneva 2410.9	M 201	>>17	69	4	14	18	28	5
	60.6.16.48	F 217	>>17	-	3	12	20	-	-
	60.6016.49	F 219	>>17	-	5	12	21	-	-
<i>clelia</i>									
	74.8.4.56	M 216	>>17(44;5<)19(149;5>)17	91	10	19	26	26	10
	90.10.6.29	M 214	>>>17(41;4<)19(146;5>)17	71	6	20	27	18	0
	1926.4.30.14	F 238	>>17(43;4<)19(159;4>)17	82	2	8	24	26	12
	51.7.17.136	M 219	>19(165;4>)17	91	6	20	24	33	8
	86.10.4.12	M 213	>>19(165;4>)17	64	12	13	19	17	3
	1929.10.19.2	F 237	>19(209;5>)17	84	3	14	32	30	5
	1902.7.29.68	F 231	>>19(142;6>)17	55	3	7	25	20	0
	* 84.2.23.40	F 213	>>19(179;5>)17	50	3	11	20	19	0
<i>errabunda</i>									
	89.8.14.25	M 221	>>17	84	11	15	22	34	0
	MHNP 7598	M 224	>>17	75+	15	14	21	25+	-
	89.8.14.12	F 234	>>17	71	5	8	27	31	0
	1988.717	F 230.5	>>(7;4>)17	-	4	11	-	-	-
<i>rustica</i>									
	86.1.19.21	M 206	>>19(176;5>)17	61	14	22	16	9	0
	81.7.2.9	M 196	>>>19(129;4>)17	60	6	23	17	16	0
	95.9.17.21	F 212	>>19(177;4>)17	55	7	17	19	12	0
	1933.9.5.7	F 195	>>19(128;4>)17	39	3	9	21	6	0
<i>bicolor</i>									
	1927.8.1.234	F 178	19(96;5>)17	59	3	15	15	21	5
	1980.1651	F 177	19(108;4>)17	58	3	12	16	23	4

Table 2 Distribution of tubercles on the dorsal, frontal and parietal scales of some selected specimens of *Clelia*.

		Dorsal scale-row nos.										fr	par	
		1	2	3	4	5	6	7	8	9	10			
<i>scytalina</i>	68.4.7.7	M	-	-	4	1	4	2	1	5	4		117	98
<i>equatoriana</i>	60.6.16.47	M	-	1	-	-	1	1	1	1	2		129	98
<i>clelia</i> 19:19:17	1930.10.10.188	M	-	-	-	-	-	-	-	2	3	2	151	104+
<i>clelia</i> 19:19:17	94.3.14.60	F	1	3	1	1	4	2	4	4	3	4	96	87
<i>clelia</i> 17:19:17	89.4.8.2	M	2	3	-	2	3	3	3	4	6	6	150	112
<i>errabunda</i> St L.	89.8.14.25	M	-	-	-	-	-	1	2	-	-		138	92
<i>errabunda</i> St L.	MNHP 7598	M	-	-	-	-	-	1	2	-	-		200	104
<i>errabunda</i> 'Dominica'	89.8.14.12	F	-	-	-	-	3	4	5	3	2		186	152
<i>errabunda</i> 'Demerara'	1988.719	F	-	-	-	1	1	1	1	2	-		141	132
<i>rustica</i>	1909.11.2.16	M	-	-	-	-	-	-	-	-	-	-	72	45+
<i>bicolor</i>	1980.1651	F	-	-	-	-	-	1	1	1	1	1	45	34

Table 3 Comparison of *Clelia* species.

	n	suplabs	V	C	Max teeth	L.lung	Trachea	Vert. row
<i>scytalina</i>	F 1	2:2:3	209	83	13	+	+	+
	M 1		212	75	14			
<i>equatoriana</i>	F 2	2:2:3	217-219	-	11.5	+	+	+
	M 2		201	72	12			
<i>clelia</i>	F 15	2:2:3	213-228-238	50-73-84	11.5	+	+	+
	M 13		204-215-226	64-82-91	11.3			
<i>errabunda</i>	F 2	2:2:3	231-234	71	14	+	-	-
	M 2		221-224	84	13.7			
<i>rustica</i>	F 7	2:2:3	195-208-231	39-44-55	11.3	-	-	-
	M 2		195-210-223	61	13.0			
<i>bicolor</i>	F 2	3:2:3	177-178	58-59	15.5	-	-	-

V = ventrals, C = subcaudals, min-mean-max; mean no of anterior maxillary teeth; - = primitive, + = derived state of left lung, trachea and vertebral scale-row.